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DRAFT

MU2BB-A

MULTIMETER, DIGITAL

1. GENERAL. This procurement requires a solid-state digital multimeter designed for laboratory and occasional field use.

2. CLASSIFICATION. Type II, Class 5, Style E, and Color R in accordance with MIL-T-28800 for shipboard applications.

3. MEASUREMENT CAPABILITIES. The equipment shall be capable of measuring ac and dc voltage, dc current, resistance, and frequency within the ranges and accuracies specified below. The equipment shall be capable of indicating the rms, average, and average-converted-to-rms value of ac signals. The average conversion to rms shall be based on a sine wave. The equipment shall be capable of indicating the value of the input relative to a previous input, and shall also be capable of simultaneous display of the absolute value of the input. Additional measurement functions shall be as specified below.

3.1 DC voltage. Range: 200 mV to 1000V full scale. Resolution: 6-1/2 digits. Input resistance: for ranges below 100V full scale: >10 gigohms, for other ranges: 10 megohms ±1%.

3.1.1 DC accuracy. The dc voltage measurement accuracy shall be ±(50 ppm of input + 5 uV) from 18 to 28°C.

3.1.1.1 DC accuracy temperature coefficient. The dc accuracy temperature coefficient shall not exceed 3.5 ppm/°C from 0 to 18°C and 28 to 50°C.

3.1.2 Noise rejection. The dc input noise rejection ratios shall be as follows:

a. CMR: 120 dB at dc, 50, and 60 Hz with 1 kilohm imbalance in the LO input lead.

b. NMR: 60 dB at 50 and 60 Hz.

3.1.3 Maximum input. The equipment shall be capable of withstanding an input of 1100 Vdc for an indefinite period without damage.

3.2 AC voltage. Range: 200 mV to 750V full scale. Frequency range: 2 Hz to 1 MHz. Resolution: 6-1/2 digits. Input impedance: 1 megohm ±2% shunted by <140 pF. Input coupling: ac and ac+dc.

3.2.1 AC accuracy. AC voltage measurement accuracy shall be as detailed in table I.

TABLE I. AC voltage accuracy

	Accuracy: ± (percent of input + percent of range) @ 23° ±5°C				
	Frequency (Hz)				
Range	2 - 30	30 - 50k	50k - 100k	100k - 200k	200k - 1M
200 mV	0.15 + 0.015	0.06 + 0.015	0.17 + 0.015	0.5 + 0.025	2.0 + 0.1
2 V	0.15 + 0.015	0.06 + 0.015	0.17 + 0.015	0.5 + 0.025	2.0 + 0.1

20 V	0.15 + 0.015	0.13 + 0.015	0.17 + 0.015	0.5 + 0.025	4.0 + 0.2
200 V	0.15 + 0.015	0.13 + 0.015	0.17 + 0.015	0.5 + 0.025	4.0 + 0.2
750 V	0.15 + 0.015	0.22 + 0.015	0.50 + 0.015		

3.2.2 AC accuracy temperature coefficient. The ac accuracy temperature coefficient shall not exceed: ±(0.004% of rdg + 0.001% of rng)/°C on the 200 mV and 2V ranges, ±(0.006% of rdg + 0.001% of rng)/°C on the 20 and 200V ranges, and ±(0.012% of rdg + 0.001% of rng)/°C on the 750V range.

3.2.3 Crest factor. The equipment shall respond to signals with crest factors up to 5:1.

3.2.4 Maximum input. The equipment shall be capable of withstanding up to ±1100 volts peak or a volts x hertz product of 2 x 10E7 without damage.

3.2.5 AC Volts display units. The equipment shall be capable of indicating the measured value in volts, dB, and dBm referenced to 50, 75, 93, 135, 300, and 600 ohms.

3.3 DC amps. The equipment shall be capable of series-circuit and in-circuit (unbroken circuit) current measurements.

3.3.1 Series-circuit. Range: 10 mA to 2A full scale. Resolution: 6-1/2 digits. Overload protection: replaceable 2A fuse rated for 250V.

3.3.1.1 Accuracy. ±0.1% of reading from 18 to 23°C, ±0.2% of reading from 0 to 18 and 28 to 50°C.

3.3.2 In-circuit. Range: 1 mA to 10A. Resolution: 100 uA. Accuracy: ±(5% of reading + 2 counts) from 18 to 28°C.

3.4 Frequency. The equipment shall be capable of measuring frequency over the range of 1 Hz to 15 MHz. Minimum signal level: 60 mV or less from 1 Hz to 5 MHz, 350 mV or less from 5 MHz to 15 MHz. Maximum input: same as for ac volts (see 3.2.4).

3.5 Resistance. The equipment shall be capable of four-wire resistance measurements from 100 ohms to 200 kilohms full scale, and two-wire measurements from 100 ohms to 100 megohms full scale. Resolution: 6-1/2 digits.

3.5.1 Accuracy. The resistance measurement accuracy shall be ±(0.01% of input + 0.004% of range) from 0 to 1 megohm, and ±(1.0% of input + 0.01% of range) from 1 to 100 megohms.

3.5.2 Resistance input protection. All resistance ranges shall have input protection from applied voltages of at least 250 Vrms.

3.6 Controls and displays.

3.6.1 Controls. The equipment shall be provided with automatic and manual ranging for all functions.

3.6.2 Displays.

3.6.2.1 Functional displays. The equipment shall be equipped with multiple 6-1/2 digit vacuum fluorescent, LCD, or LED displays. The primary display shall be clearly discernible from the secondary displays and shall indicate the selected measurement of primary interest, such as dc volts. Each display shall indicate the ac measurement type, such as rms, average, peak-to-peak, etc. The secondary displays shall

allow the simultaneous display of related measurements of interest, such as ac volts riding on a dc level and the frequency of the ac voltage. Each display shall have automatic dc polarity indication.

3.6.2.2 Bar-graph display. One or more secondary displays or a separate, dedicated display shall be useable as a bar-graph indicator with a range of 0 to full scale of the selected range. The bar-graph shall also provide an indication of deviation from 0 normalized to a percentage of the full scale value of the selected range. The 0 center value shall be either 0 Volts or relative to an input reference value. The percentage of full scale shall be selectable over a range of 0.01 to 100 percent.

4. GENERAL REQUIREMENTS.

4.1 Power source. MIL-T-28800 nominal power source requirements are invoked. Maximum power consumption: 100W.

4.2 Weight. 10 kg (22 lb) maximum.

4.3 Digital interface. A digital interface is required in accordance with MIL-T-28800. Additionally, the interface shall be compatible with the command structure adopted by the Standard Commands for Programmable Instruments Consortium.

4.4 Lithium batteries. Per MIL-T-28800, lithium batteries are prohibited without prior authorization. A request for approval for the use of lithium batteries, including those encapsulated in integrated circuits, shall be submitted to the procuring activity at the time of submission of proposals. Approval shall apply only to the specific model proposed.

4.5 Accessories. The equipment shall be provided with safety-designed banana plug test leads in accordance with MIL-T-28800. The equipment shall also be provided with the appropriate probes for use in making in-circuit current measurements.